

Space Weather Research at NSF:

What's new?

A sample by:

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National Science Foundation



National Science Foundation Directorate For Geosciences



New!

**Division of
Atmospheric & Geospace Sciences
(AGS)**

**Division Director: Michael Morgan,
U. Wisconsin, July 2010**

Geospace Section (GS)

Advancing scientific knowledge of
Earth's environment



Annual Space Weather Solicitation

- ◆ **Since 1996**

- **Funded at a level of ~\$3M/year**

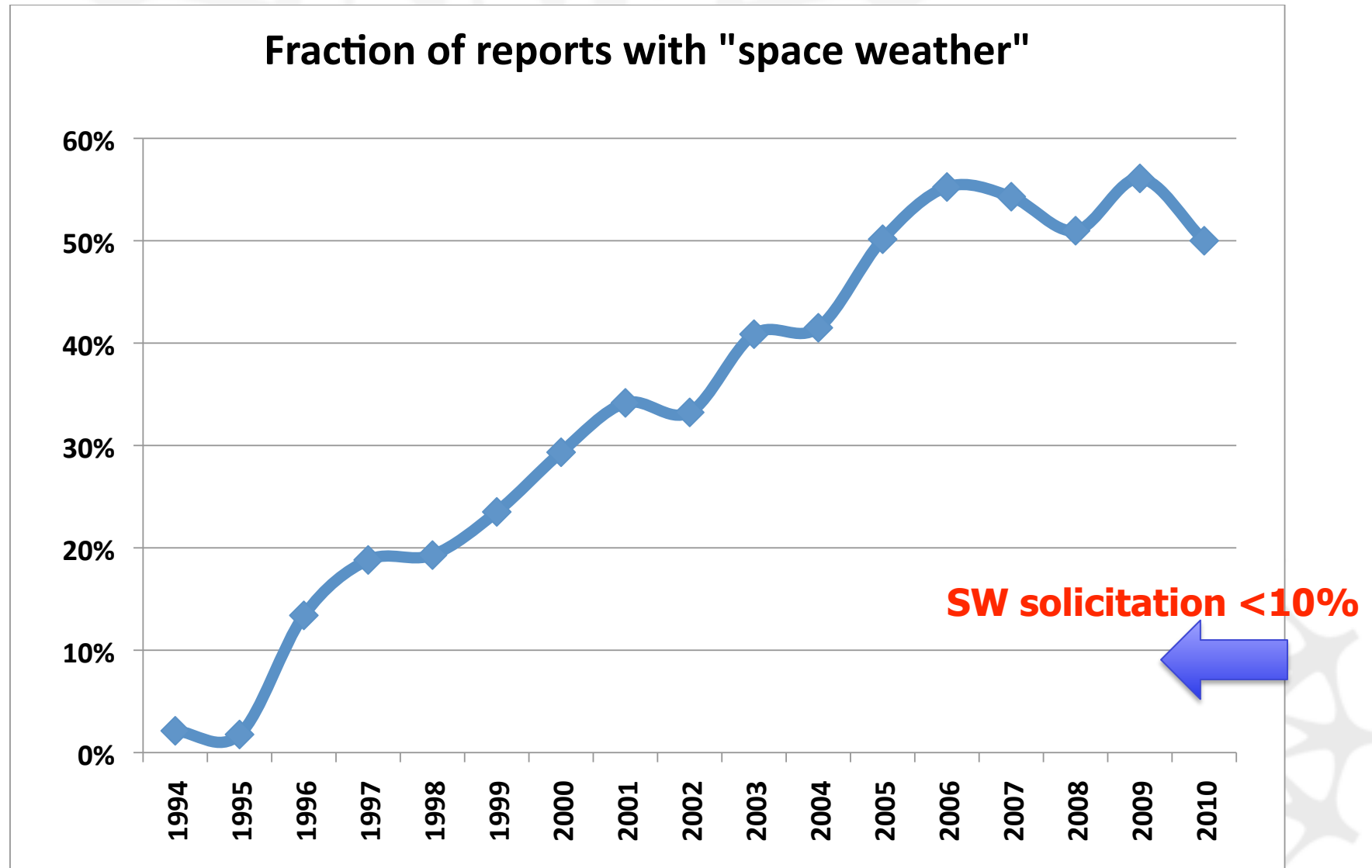
- ◆ **This year: 49 proposal**

- **Submitted in January; under review**

- ◆ **Thriving and productive**

- **Space Weather concept successfully adopted by research community**

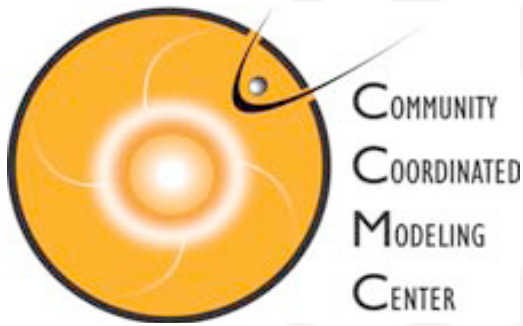
Main-streaming of SW Research



Rethinking NSF Space Weather Funding



- ◆ Utilize overlap with CEDAR, GEM, and SHINE programs
 - **Boosting funding of these slightly**
- ◆ Continue Collaborative SW Modeling program
 - **6 projects funded jointly with NASA and AFOSR in 2006/7**
- ◆ SW research is part of upcoming new GEO-wide program: Dynamic Earth
 - **Biennially, ~\$28M**
- ▶ International Collaboration
 - **EC Framework Program 7**



- ◆ **The NSF view on CCMC:**
 - **A tremendous success with a vital mission ! !**
(Rich Behnke at the CCMC Workshop in January)
- ◆ **Now established as a facility under the UAF program**
- ◆ **Hugely successful inter-agency collaboration with NASA**

AMPERE



Continuous Global
Birkeland Currents
from the
Active
Magnetosphere and
Planetary
Electrodynamics
Response
Experiment

Brian J Anderson, Lars P Dyrud

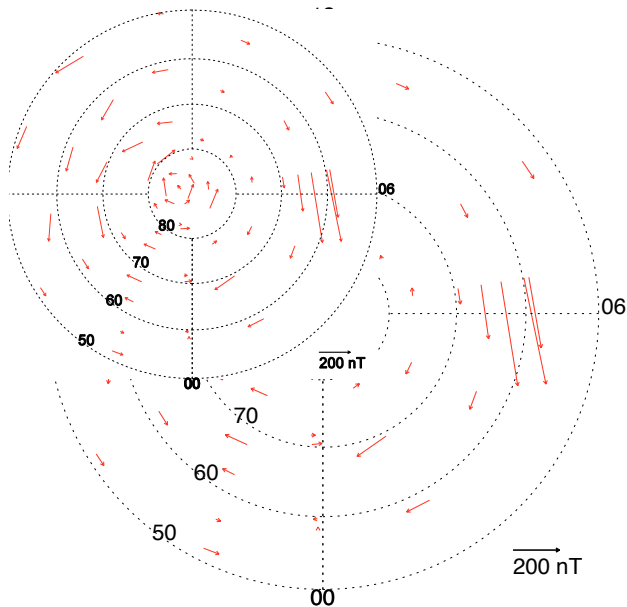
The Johns Hopkins University Applied Physics Laboratory

Side-by-side comparison of data acquired in 10 minutes.

Old:	200 s/sample
Standard AMPERE:	complete coverage with $\sim 1^\circ$ lat. res.
High rate AMPERE:	$\sim 0.1^\circ$ lat. res.

Old Data

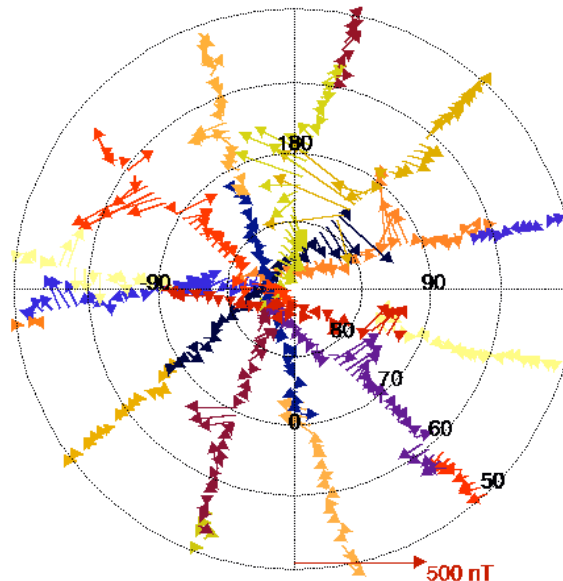
10/01/2002 11:55-12:05



TLM data from all satellites

AMPERE: Standard

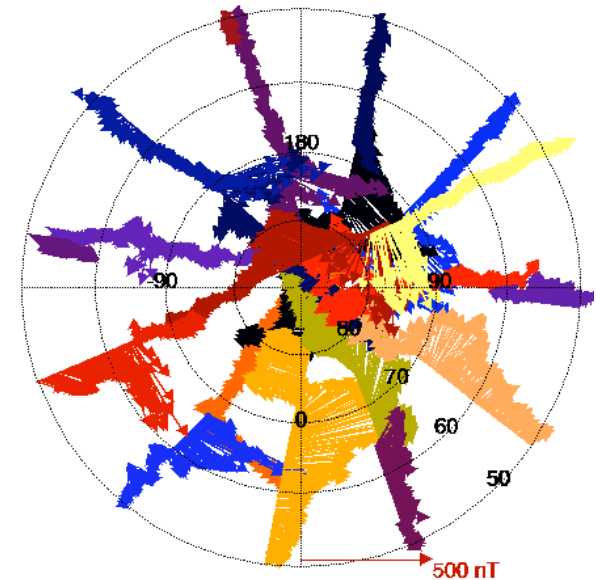
11/25/2009 08:45-08:55



Different colors denote different satellites

AMPERE: High

11/24/2009 18:27-18:37



Continual Monitoring Tested

14 February at 1800 UT through 1200 UT on 16 February



The NSF CubeSat program: Summary

- ◆ **Utilize CubeSat and P-POD technology development**
- ◆ **Space weather & atmospheric research and education**
- ◆ **Started 2008**
- ◆ **2-3 new science missions/ year**
- ◆ **Collaboration with NASA WFF on commissioning and launch services**
- ◆ **Collaborate with DOD, NASA, Industry on launch opportunities**
- ◆ **40 missions proposed; 6 projects started**



CubeSat Science

◆ Solar & Heliosphere:

- Flares, Solar energetic particle events, CMEs

◆ Magnetosphere:

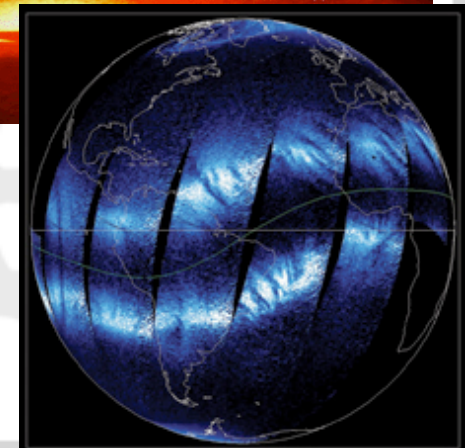
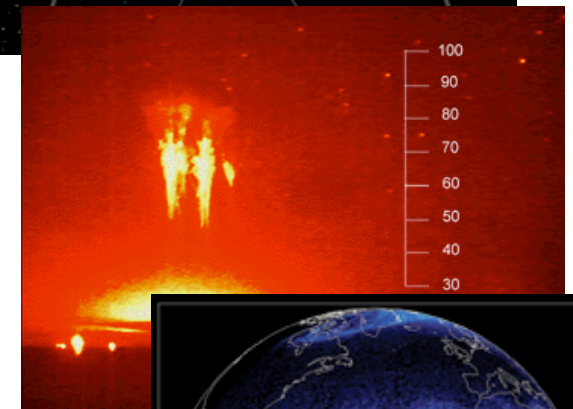
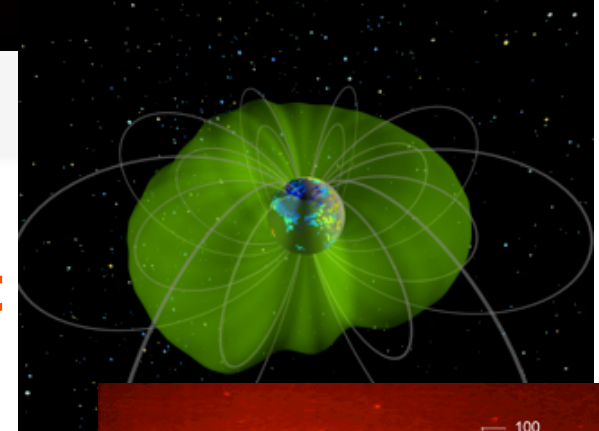
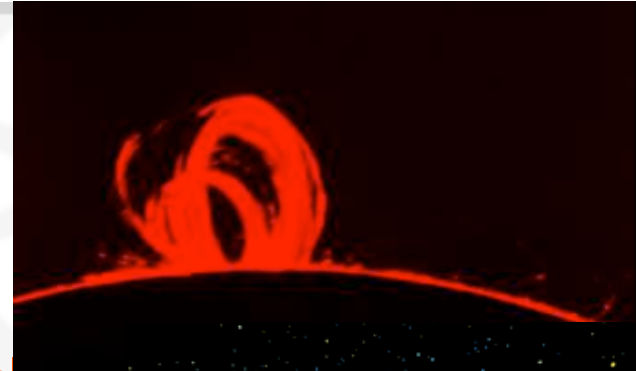
- Radiation belts and ring current dynamics, Magnetosphere-ionosphere coupling

◆ Ionosphere, Mesosphere:

- Irregularities, electro-dynamics, neutral interaction, composition, chemistry

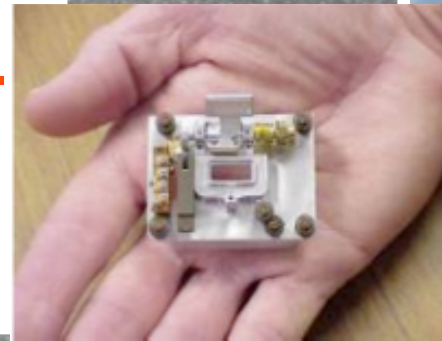
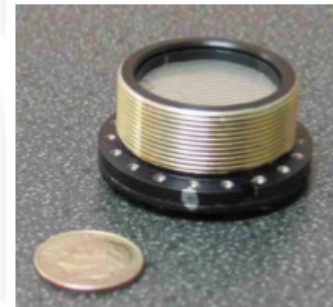
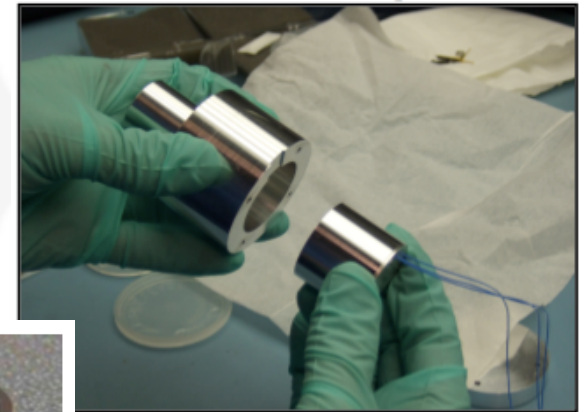
◆ Atmosphere:

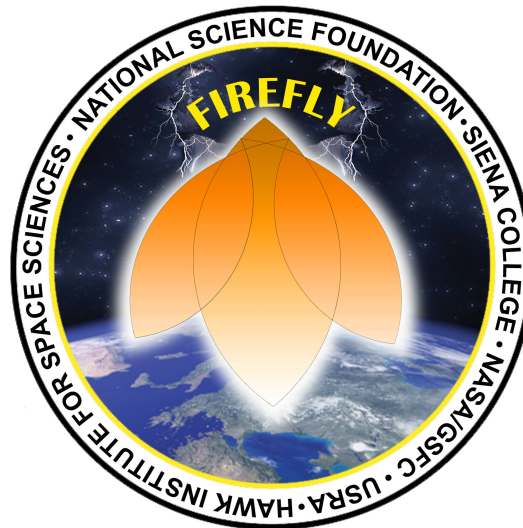
- Cloud physics, albedo, lightning effects, pollution, hurricane dynamics



CubeSat Experiments

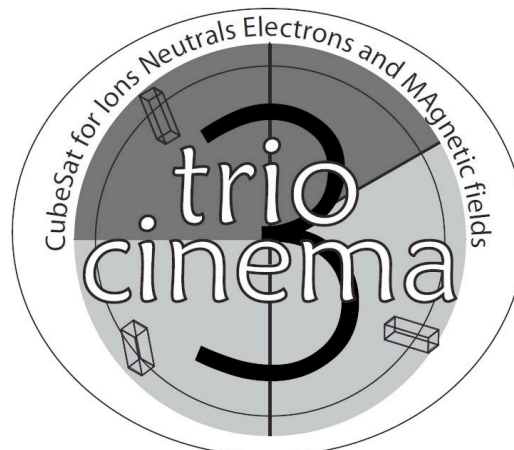
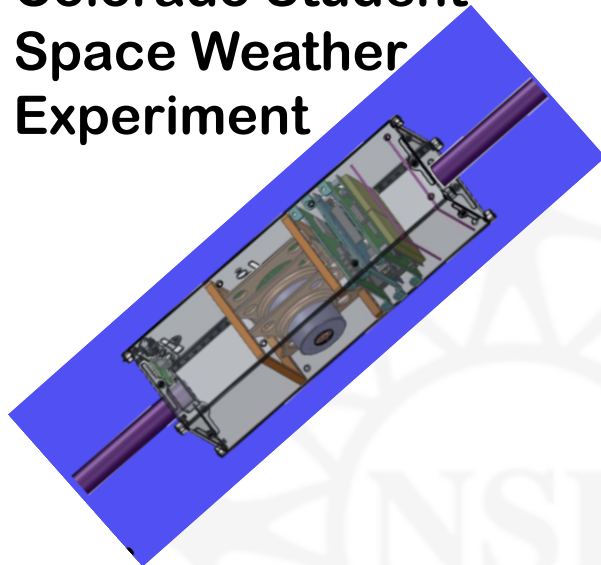
- ◆ E & M fields and waves
 - ◆ Radio waves
 - VLF-UHF
 - microwave
- ◆ Plasma and particles
 - Electrostatic probes – mass & imaging spectrometers,
 - keV-MeV
- ◆ Photometers & imagers
 - near IR- UV
 - X & gamma rays





NSF CubeSat Projects

Colorado Student
Space Weather
Experiment



Space Sciences Laboratory, UC Berkeley
Kyung Hee University of South Korea
Imperial College London

